DYNAMICAL METEOROLOGY.[1]

By FELIX M. EXNER.

[Review.]

This work is essentially a mathematical discussion of certain phenomena mainly connected with movements of the air. As it treats with only selected portions of meteorology it is not a general text book. While it is far from easy reading, nevertheless, it is well worth while for the mathematically inclined. One particularly interesting section deals with the rate of temperature decrease with altitude of an adiabatically rising mass of air through an atmosphere whose gradient is "non-adiabatic."—*W. J. H.*

DUST STORM AT SALT LAKE CITY APRIL 4, 1919.

The Deseret News, April 5, 1919, of Salt Lake City, Utah, reports a storm of alkaline dust, which covered a large portion of Utah on April 4, 1919. This storm was preceded by a shift of the wind from south to northwest, with a wind of gale force, and was accompanied by rather violent fluctuations of the barometer. The cloud bearing the dust was black and appeared to extend a great distance to the north and south, as seen from Salt Lake City. Rain fell as the dust hung over the city, resulting in considerable inconvenience from bespattered windows, automobiles, etc. The mud was of distinctly salty taste, and many thought that it was salt from the Great Salt Lake; but it was simply desert mud containing a high percentage of salts.

DUST STORM AT PORTLAND, OREG., SEPTEMBER 27, 1919.

The following is the report of an unusual deposit of mud which occurred at Portland, Oreg., on September 27, 1919:

The particles were brought down in suspension in rain-drops, the rain continuing for about two and one-half hours. The quantity was sufficient to make a thin coating over all exposed objects. When dry it was of gray color, and resembled fine, light, decomposed lava soil, such as is found over large areas in the intermountain region.

There had been no dust storms in this vicinity, but reports from the interior of the State indicated that the air had been very dusty for several days. Passengers arriving on the Oregon-Washington Railway & Navigation Co. train on the 28th reported the most dusty trip ever experienced. Cooperative observers report an unusually dusty condition as follows: Milton, 29th; Pendleton, 27th; Pilot Rock, 28th; Prairie City, 27th–28th; Riverside, 27th–30th; Umatilla, 27th.

The deposit of mud seems to have been confined to a small area in the vicinity of Portland and up the Columbia River toward Cascade Locks. Apparently the dust had been carried by wind through the Columbia Gorge, and had not spread over a wide area west of the Cascades.

The cooperative observer at Dayville writes as follows: "Your city was not the only place the dust fell, for it covered and penetrated everything, even to the inside of our piano. It is impossible it could have come from summer fallow, in fact it hadn't the appearance of that kind of dust, but more nearly approaching the color of pumice, it hung over this section of country for two days."—*Edward L. Wells.*

[1] Dynamische Meteorologie. Leipzig. 1917. ix, 308 p., charts, diagrs. 23 cm.

DIFFICULTIES IN THE THEORY OF RAIN FORMATION.[1]

By W. J. HUMPHREYS.

[Author's abstract.]

The formation of raindrops has never been satisfactorily explained. The general assumptions seem to be (1) that as soon as saturation is passed, condensation occurs on the nuclei present; (2) that the larger droplets, owing to their lesser vapor tension, grow at the expense of the smaller; and (3) that the larger and faster falling droplets unite with enough others on their downward path to form full-sized raindrops.

All this sounds very plausible, but it will not stand analysis. It is true that as the temperature falls below the dew point, condensation does occur on the dust particles and any other nuclei that may be present. But this at once introduces a formidable difficulty; that is, the number of such particles is so great that even all the water present could not develop them to a "falling" size. It is also true that the larger drops do grow at the expense of the smaller, but, according to theory, at a rate far too slow to be effective in the process of rain production. Finally, even if a droplet should fall quite through a cloud layer, and actually coalesce with all particles in its path, the chance of its thus becoming a full-sized raindrop would be very small.

The chief steps in rain formation seem to be (*a*) the continuous ascent of humid air; (*b*) the formation of cloud droplets on the nuclei of this air as soon as it cools below the dew point; (*c*) the filtering by these droplets of the next rising air; (*d*) the progressive condensation, in the midst of the rain cloud, on the relatively few droplets present in this automatically filtered air, and their consequent growth to "falling" size; (*e*) coalescence with other droplets, facilitated by such electrical changes as they may have—and they are nearly always charged.

[1] Presented before the joint meeting of the American Physical Society and American Meteorological Society, St. Louis, Dec. 30, 1919.

EVIDENCE OF CLIMATIC EFFECT IN THE ANNUAL RINGS OF TREES.[1]

By Prof. A. E. DOUGLASS, University of Arizona.

[Author's abstract.]

The rings of the yellow pine in northern Arizona show varying thickness in marked correlation with rainfall. The sequoias of California show similar characteristics. In less degree climatic effects may also be detected by finding similarity in ring growth of trees over large areas.

DISCUSSION.

Prof. H. J. Cox had noted a waxy deposit on the leaves of trees in Montana during a drought, and asked if this was the case in Arizona.

Prof. Douglass replied that this is a general characteristic of vegetation in the Southwest.

Prof. W. J. Humphreys asked if the cliff dwellings in Arizona can be dated by getting the age of the timber used in them.

Prof. Douglass answered that this probably could be done. He called attention also to the fact that in wet regions the rings show a very evident relation to solar radiation through sun-spot numbers, but that in dry regions the rainfall is a much more obvious cause of variations in the rings of trees.

[1] Presented before American Meteorological Society, St. Louis, Mo., Dec. 30, 1919. See "Climatic cycles and tree-growth. A study of the annual rings of trees in relation to climate and solar activity." Carnegie Institution of Washington, D.C., 1919. 127 p. illus. plates. 26cm.